

Deliverables for iQVet, WP2

D2.1 Best practice guideline monitoring change in attitudes, knowledge and skills during the national pilots.

Introduction

Demands on the modern mechanical designers are increasing and the fields of knowledge they must cover are many. The designers must decide what conditions a product must be able to meet, which material to be used and how the welding process can affect the structures in the form of welding residual stresses or deformations caused by weld shrinkage. They also need to consider the possibilities and limitations of production unit as well as the manufacturing costs.

Two pilot short-term hybrid work-based course were performed during April – June 2023 in Växjö and Finspång in Sweden to monitor the change in attitude, knowledge, and skill of participants and teachers. The aim was to develop a best practice guideline for a work-based training and further develop the learning material and lessons.

The target groups were working mechanical designers, employed by construction and manufacturing industry with very limited time for participating in any other activities than their daily business.

The course is based on a simple website platform for distribution of course material and e-mails for communication with participants.

The course content is theoretical and based on Eurocodes which fulfils the requirements from International Institute of Welding. The course material includes a handbook and digital (PDF) teaching material (OH).

Previously experiences from the training courses showed the needs of supplementary videos covering different subjects in the course content. During iQVet Work Plan 1 some videos about welding methods were recorded and adapted to the presentation material which were used during the pilot courses.



Co-funded by the
Erasmus+ Programme
of the European Union

Disclaimer

The European Commission's support for the production of this publication does not constitute endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Monitoring the change in attitude, knowledge, and skill

For the teachers

Teachers do not need to be able to manage the course web platform apart from being able to log into course website and download the course material.

For better adapting of this training as work-based learning, the teachers had during iQVet-WP1 highlighted the needs of further development of the teaching material and supplementary videos covering different course subjects.

Some videos were then recorded and together with further developed teaching material were used during the implementation of the pilot courses as preparatory material for students to watch. The videos were also used by teachers as presentation material during lessons.

After the pilot courses the teachers were satisfied with the use of videos in their updated presentation during the lessons. The short videos helped the teacher to get more time for answering the students' questions.

For the students

The course participants attitudes, knowledge, and skills were monitored before, during and after the course gatherings.

Before the course

Successful implementation of a mixed work-based learning course requires taking part of students' questions before the course and if suited share them with other students or use them as part of the course material for group work or problem solving during the lessons.

The participants in the pilot courses received information about this opportunity in the course description and through the vocational schools' notifications by e-mail in connection with confirmation of registration.

The e-mail also contained a questionnaire about the participants' prior knowledge and skills.

The questionnaire contains following questions.

- What's your education?
- What's your position at the work?
- What's your work experiences in the field of welding and design of welded structures?
- How long have you been working in the field of welding and design of welded structures?
- Do you have any question / related issues about design of welded structures that you want to get an answer to it during the course?

After participants' reply and before the start of course gatherings, the VET school together with VET teachers, went through the answers to

- estimate the need of updating the students' previous knowledge to be prepared before the training.
- send recommendations and link to suitable learning material for students to review before coming to the course. Recommended course material can be found among recorded videos for welding methods and other course presentation material available on the course website.

- decide whether VET teachers need to adapt the course lessons to answer the participants' questions or highlight some of the participants' questions as exercises during the course.

For the pilot courses the recommendations for preparing were send individually to students.

No further adaptations regarding scope, content and lessons were necessary.

During the course

Teachers stayed in close contact with course participants to follow them through the course and answered their questions directly or by adapting the lessons.

Where applicable, the teachers also note the students' ideas as a basis for discussion with the VET school to further improve the course programme.

After the course

At the end of the course gatherings, the students evaluated the course by submitting their opinions about the course material, the teachers, the implementation, etc. in an evaluation form (see Appendix 1 & 2) to the VET school.

The VET school made a completion of the evaluations and disseminate it among participants and stakeholders. See also evaluation summaries at Appendix 1.

The VET school and the teachers discussed the result from evaluation and will use the experience from course to improve both the teaching material and the guideline for the training and teachers.

The result of discussions showed that the students were satisfied both with the training itself, course material and their own efforts. They had some comments about the practical implementation issues and the way the course helped them to develop their ability for design solutions that include welding.

VET school and the teachers decided to improve future courses by gradually implementing the students' suggestions for shortening lessons, extending the guest lecture and possibly also the course, as well as using more physical samples and practice examples.

Course: Welding för designers, WfD

Date and location: 31 May – 1 June 2023 – Finspång, Sweden

Target group: Mechanical and welded structures designers

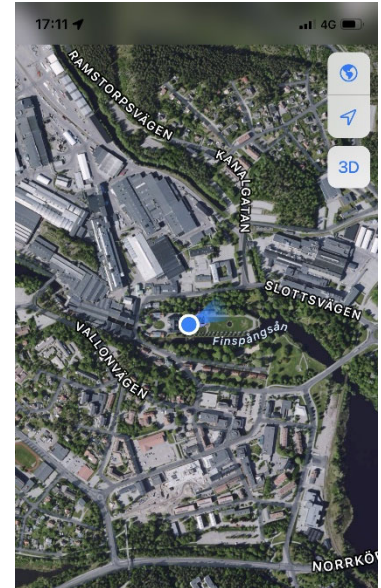
No. of participants: 15

No. of responses to course evaluation questionnaire: 12 (80%)

A WfD course, according following program, was arranged on 31 May – 1 June 2023 in Finspång, Sweden.

The presentation material used in the course was based on previous experiences from similar courses but further developed, within the framework of the iQVet project, to more efficient meet the needs of state-of-the-art knowledge in the field of welding technology for welded structures designers.

The result of course evaluation which is given here in this document and will be taken in consideration for further developing of both the course material and the course itself.



Course program

Day 1: Welding for designers

- Common welding methods (MMA, MIG / MAG, TIG, Submerged Arc Welding). Choice of welding method. Materials and filler material for welding. Welding designations on drawing with exercise. WPS and QPQR, what do they contain and what are they used for?

Day 2: Non-Destructive Testing and basic of material strength

- Welding classes and inspection methods for welding (MT, PT, UT, RT, VT). Design for automated welding. Basic aspects on welded structures regarding material strength. Examples.

Result of course evaluation

Please answer following questions!

1. What is your opinion about the course material? (Textbooks, transparencies, handouts, etc.)

- **8,5/10** (Responses:10, 7, 9, -, -, 10, 8, 8, 8, 10, 7, 8)

Comments:

- Very good and explanatory material.
- Good that course book was included.
- Good level of images compared to text.
- All slides could have been printed upon arrival.

2. What is your opinion about the teachers? (Subject knowledge, pedagogy ...)

- **8,9/10** (Responses: 10, 9, 8, 9, -, 10, 7, 9, 9, 10, 8, 9)

Comments:

- It would have liked to be at a slower pace.
- Gave very good and thoughtful answers to the questions that were asked.
- Good knowledge, good guest speakers. Was somewhat stressed, the time planning.
- Gave very good explanations of the course material. Spoke calmly and nicely, made sure everyone followed what was said.

3. What is your opinion about the teaching method/lessons?

- **8,1/10** (Responses: 10, 9, 7, 7, -, 10, 7, 7, 8, 8, 8, 8)

Comments:

- Very informative.
- A little too little time.

- Personally, I like 45-minute sessions.

4. Is there any section of the course that should get more time next time the course is given?

- Fatigue.
- More welding information.
- More calculations.
- More examples from our world.
- Longer session with guest lecturer.

5. What is your opinion about the course in its entirety? (level, content, scope, structure, and implementation)

- **7,5/10** (10, 8, 8, 3, -, 7, 7, 8, 8, 8, 7, 9)

Comments:

- A little too simple, felt trivial.
- Unfortunately, irrelevant in part.
- The level and content were very good.
- Could probably have been 3 days long course.
- Very well thought out structure and course literature.

6. (How) has this course helped to develop your ability for design solutions that include welding?

- Yes: 2 responses
- 7/10.
- Evaluation of welds.
- Good in several ways.
- Symbols and designations.
- Good foundation to stand on when it comes to the construction of welded joints.
- Mostly as an introduction for me as I had no knowledge of welding before.
- More details on how a weld joint should be designed for a sensible construction.

7. The best part of the course was ...

- Welding methods.
- Being able to ask questions.
- See welded examples.
- Mixed content was good.
- Practical examples, design tips.
- Review of the various welding methods.
- How to write weld designations on the drawings.
- The handbook, symbols, designations and good teachers.
- The course material, the overhead presentations, the physical tests, the teachers

8. If I could change the course, I would ...

- Don't know.
- Extended it by one more day.
- A longer lecture with guest lecturer.
- More physical test pieces and examples of good weld joints compared to bad joints.
- Possibly included something more regarding welding in pressure vessels and pipe welding.

9. Was your prior knowledge sufficient to follow the course?

- Yes: 6 responses
- Yes, it was at a level that allowed me to follow and understand the course.

10. Other comments:

- Satisfied with the course.
- Thanks for a well done course.
- Rather answer a web survey and get to digest the course a bit.

Course: Design of welded products with Welding för designers, SK2-WfD

Date and location: April 11–12 & 18–19, 2023, Växjö Sweden and online

Target group: Mechanical and welded structures designers

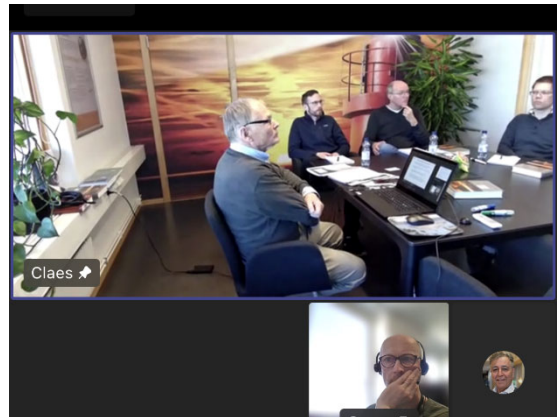
No. of participants: 4

No. of responses to course evaluation questionnaire: 4 (100%)

A SK2-WfD course, according following program, was arranged April 11–12 & 18–19, 2023, in Växjö, Sweden and online.

The presentation material used in the course was based on previous experiences from similar courses but will be further developed, within the framework of the iQVet project, to more efficient meet the needs of state-of-the-art knowledge in the field of welding technology for welded structures designers.

The result of course evaluation which is given here in this document and will be taken in consideration for further developing of both the course material and the course itself.



Course program

Day 1: Welding for designers, WfD. (Ali)

- Common welding methods (MMA, MIG / MAG, TIG, Submerged Arc Welding). Choice of welding method. Materials and filler material for welding. Welding designations on drawing with exercise. Welding classes and inspection methods for welding. Design for automated welding.

Day 2: Basic design strategies for welded products. (Claes)

- Basic aspects on welded structures regarding material strength. Tips and suggestions for functional welded products. Design against corrosion. Examples.

Day 3: Design of welded structures subjected to static loads. (Claes)

- Residual stresses and weld deformations. Brittle fracture. Lamellar tearing. Design against static loads. Short about the instability of slender structures. Examples.

Day 4: Design of welded structures subjected to fatigue. (Claes)

- Background. The phenomenon Material Fatigue in welded structures. Tips and suggestions. Design against fatigue. Examples.

Result of course evaluation

Please answer following questions!

1. What is your opinion about the course material? (Textbooks, transparencies, handouts, etc.)

- **WfD: 10/10** (10, 10, 10)
- **SK2: 9,5/10** (8, 10, 10, 10)

Comments:

-

2. What is your opinion about the teachers? (Subject knowledge, pedagogy ...)

- **WfD: 10/10** (10, 10, 10)
- **SK2: 10/10** (10, 10, 10, 10)

Comments:

-

3. What is your opinion about the teaching method/lessons?

- **WfD: 10/10** (10, 10, 10)
- **SK2: 9,75/10** (9, 10, 10, 10)

Comments:

- The exercise tasks were perceived as sufficiently extensive. Personally, however, I need to sit in my solitude afterwards and rehearse for everything to fall into place.

4. Is there any section of the course that should get more time next time the course is given?

-

5. What is your opinion about the course in its entirety? (level, content, scope, structure, and implementation)

- **9,75/10** (9, 10, 10, 10)

Comments:

- Stories from real life are always welcome to hear.
- Felt adequate. Not too much caving into details. The last day was the heaviest, but with some own repetitions of the material it will surely become clearer.

6. (How) has this course helped to develop your ability for design solutions that include welding?

- Yes
- Absolutely. Got to rehearse and was reminded about the placement and design of welds.

7. The best part of the course was ...

-

8. If I could change the course, I would ...

- Some more practice tasks.
- Decrease on day 2 and increase on day 4.

9. Was your prior knowledge sufficient to follow the course?

- Yes.
- Believe it. However, I have reached the age when you are a little slow to access your information.

10. Other comments:

-